Portland Harbor Pre-Call/Background

Presentation to the
CSTAG/NRRB
October 27, 2015

Kristine Koch, U.S. EPA Region 10

Portland Harbor

Remedial Action Levels vs. PRGs

RALs vs. PRGs

- Entire site (2,190 acres) exceeds PRGs
  - Too expensive to clean up to PRGs
- Allows for range of alternatives in FS
  - Less action to more action
  - Identify sediment management areas– capping/dredging
- Levels of Active Risk Reduction
  - Maximum incremental reduction
  - Point of minimum concentration change
- MNR/EMNR to achieve RG
- Background considered

Focused COCs

- Subset of COCs with most widespread footprint
  - PCBs
  - PAHs
  - Dioxins/furans
    - PeCDD
    - PeCDF
    - TCDD
  - DDx

Example RAL Curve

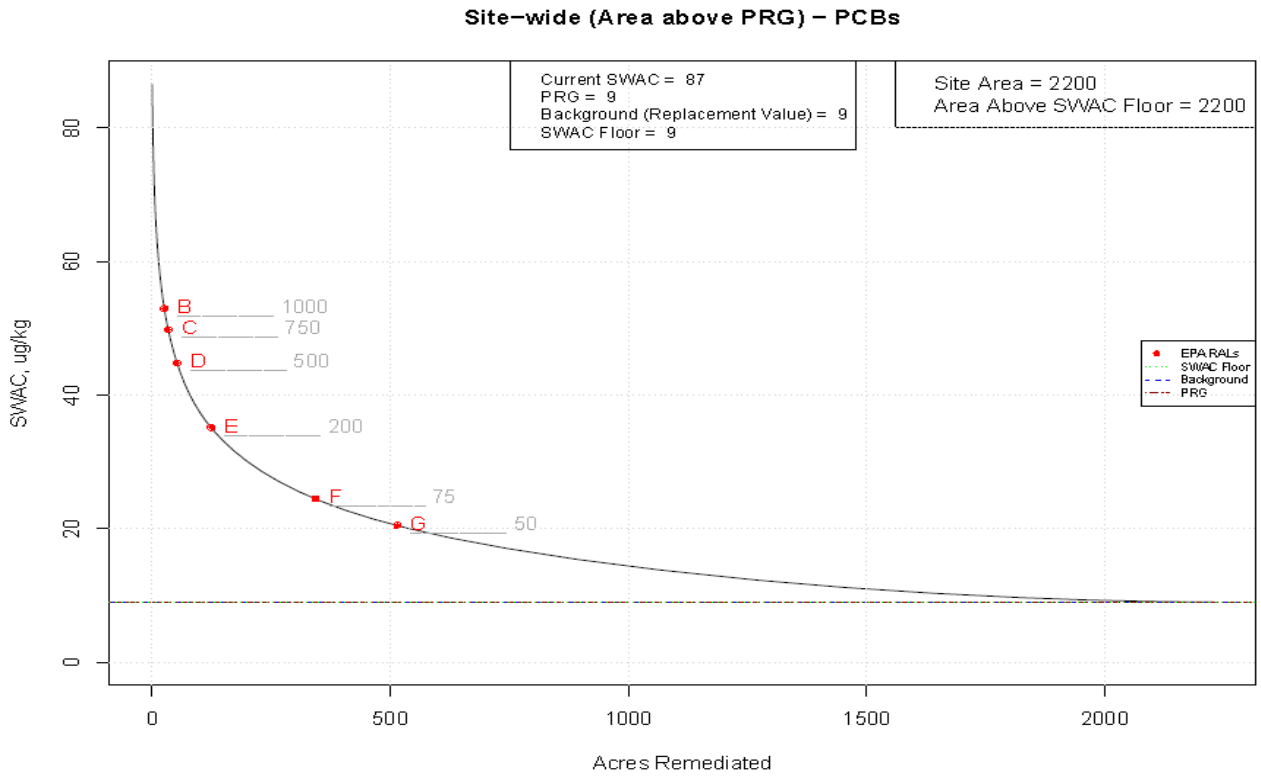


Figure 3.3-1
PCBs Site-wide RAL Curves

Remedial Action Levels

Contaminant	B	C	D	E	F	G
PCBs	1,000	750	500	200	75	50
Total PAHs*	170,000	130,000	69,000	35,000	13,000	5,400
1,2,3,7,8-PeCDD	1	1	1	0.2	0.2	0.009
2,3,4,7,8-PeCDF	0.003	0.002	0.0008	0.0008	0.0008	0.0008
2,3,7,8-TCDD	0.002	0.002	0.002	0.0006	0.0006	0.0006
DDx	650	550	450	300	160	40

*Equivalent to cPAH RALs in draft FS.
All units µg/kg.

Portland Harbor

Assignment of Technologies

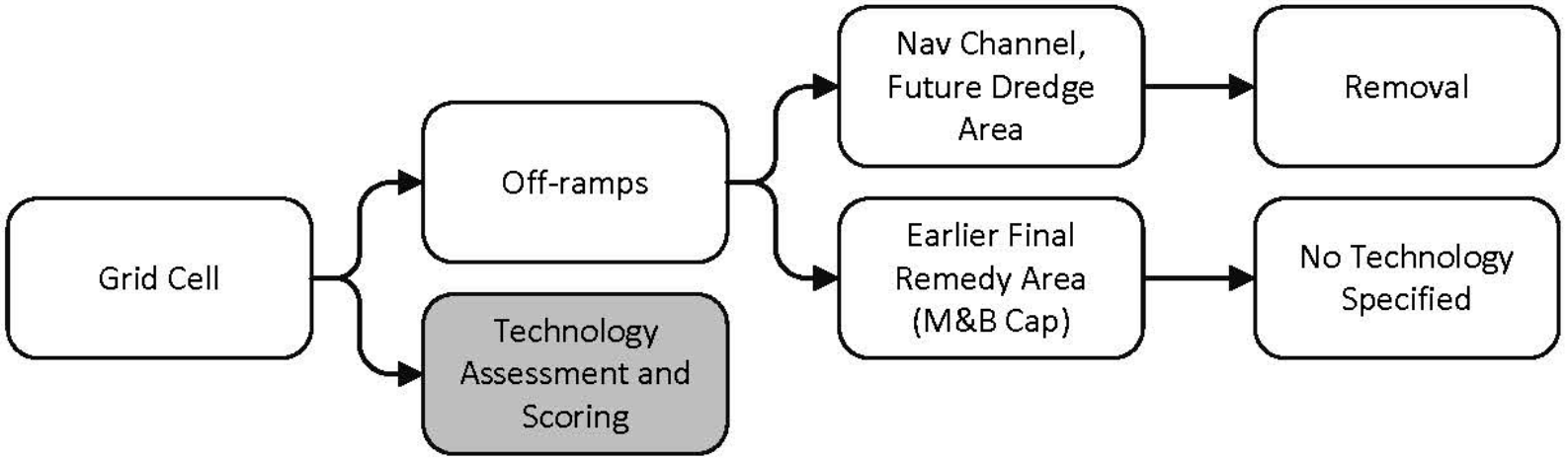
Technology Assignment

Objective: Develop a process that evaluates remedies based on environmental conditions:

- hydrodynamics, sediment bed characteristics, and anthropogenic conditions
- Uses a decision tree / multi -criteria decision approach to indicate an appropriate technology:
- EMNR/in-situ treatment
- Cap – engineered cap with/without active component
- Dredging

Outcome: Process indicates appropriate technology based on analysis… **It does not select a remedy**.

Overview of Technology Assignment Process



Technology Assignment Matrix

Criteria Scoring

- +1 = technology favorable
- 0 = technology neutral
- -1 = technology unfavorable
- NC = not applicable

Technology Assessment Scoring		Dredge	Armor Cap	Cap
Hydrodynamics	Wind/Wave Zone?	1	0	NC
	Erosive?			-1
	Depositional? (<2.5cm/year or Subsurface:Surface Ratio>2)?	-1	1	1
	Shallow?	1	-1	0
Sediment Bed Characteristics	Slope 15-30%?	1	1	NC
	Slope >30%		0	
	Rock, Cobble, Bedrock Present?	-1	1	1
Anthropogenic Influences	Structures/Pilings?	-1	1	1
	Prop Wash Zone?	1	0	NC
	Moderate or Heavy Debris?	-1	0	1
	Technology Score	Sum Scores for Each Technology		

Hydrodynamics Criteria

Erosive OR Wind/Wave Zone

- Erosive = shear stress exceeds critical shear stress for 2 year recurrence (flood) event – sediment texture as modeled by LWG
- Wind/wave zone – near shore areas – layer provided by LWG as part of FS GIS data

Depositional

- Either depositional (> 2.5cm/yr) May 2003 to 2009 Surveys (same period LWG preferred for model calibration)

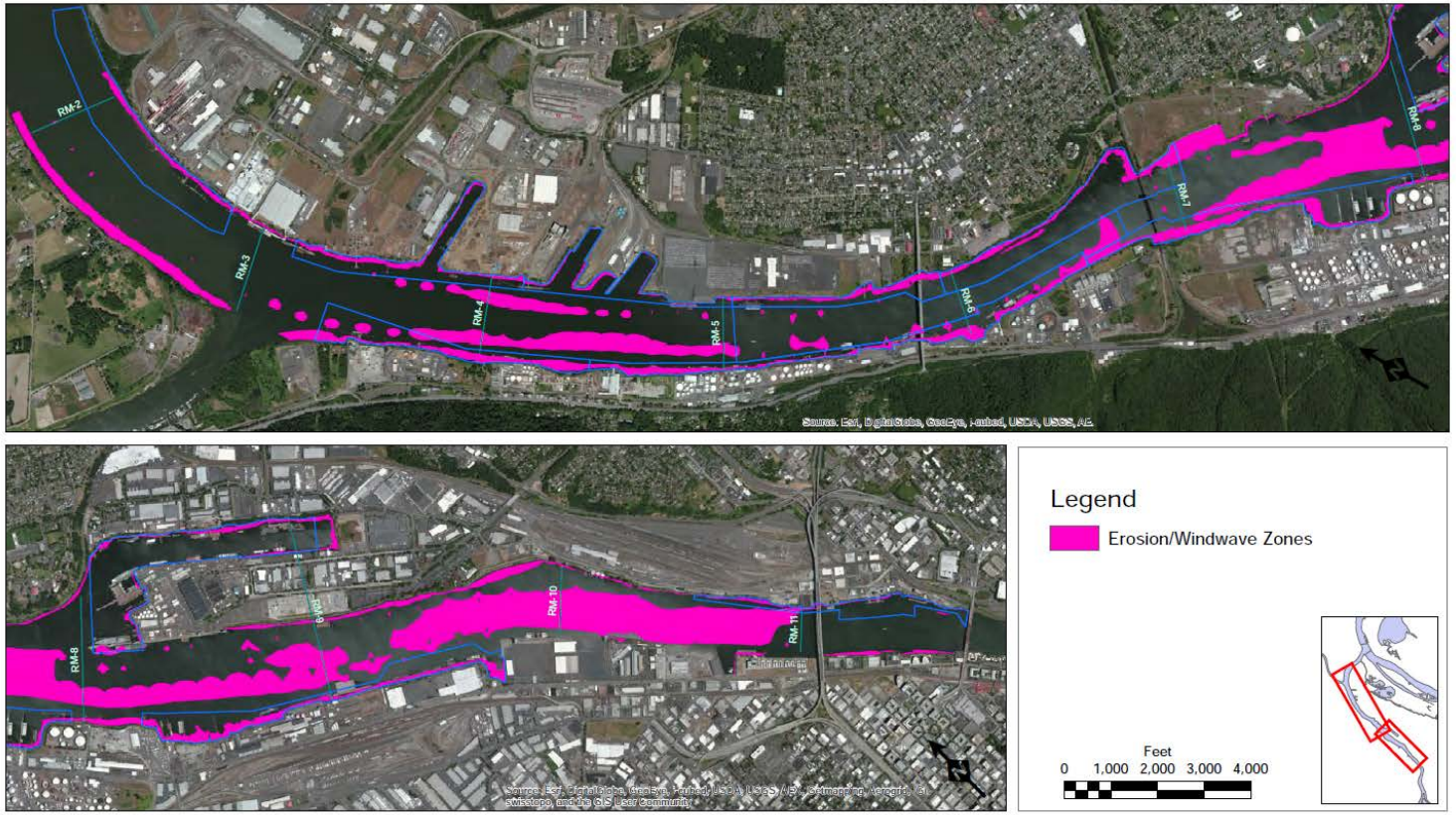
  OR

- Average Subsurface/Surface RAL concentrations > 2
  - Interpolate 4 RAL COCs – surface vs. subsurface
  - Surface or subsurface must exceed RAL G
  - Average of remaining RAL ratios

Shallow

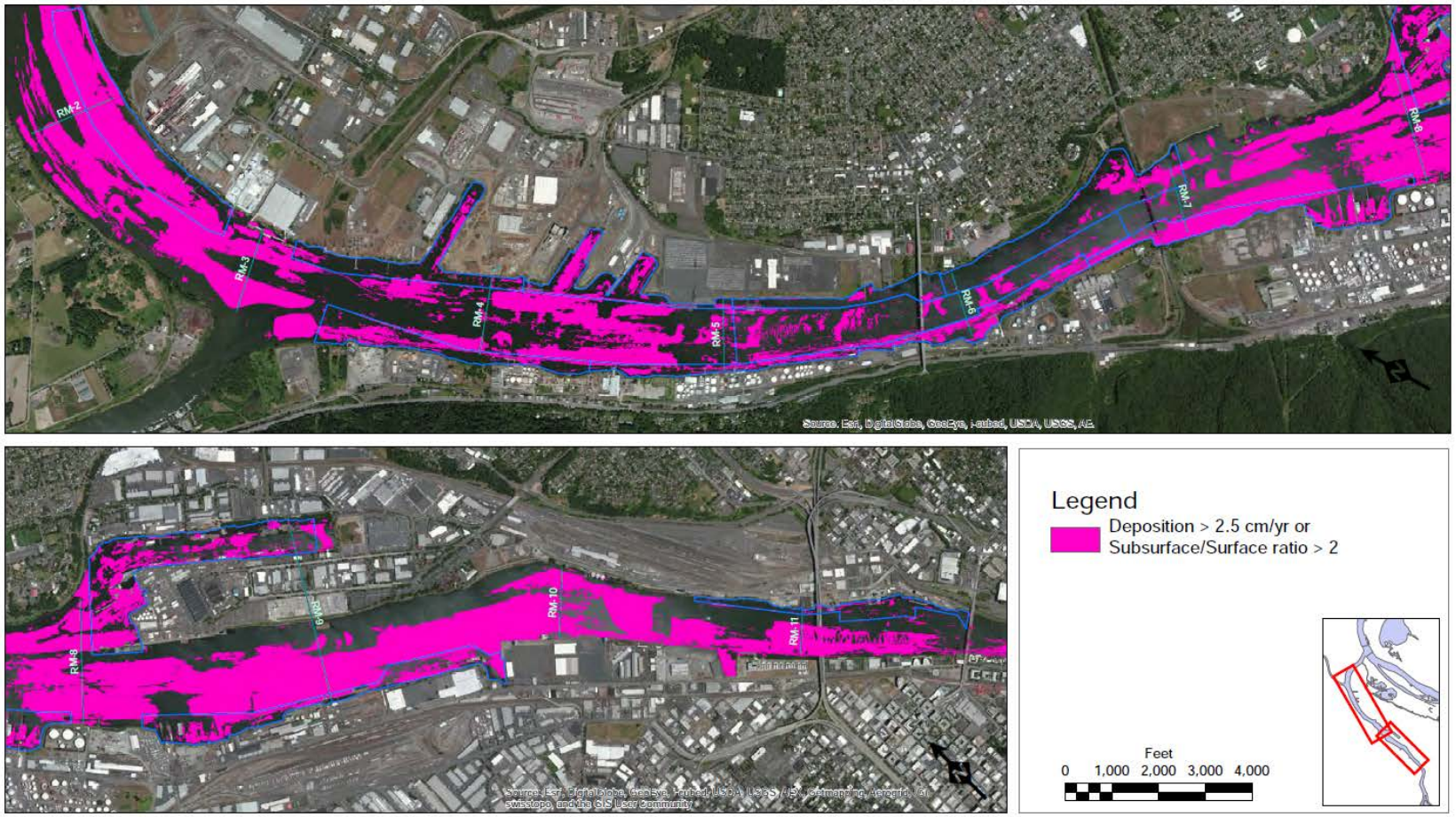
- Shallow- <1 m at low water level, >2 feet NAVD 88

Wind/Wave Zone



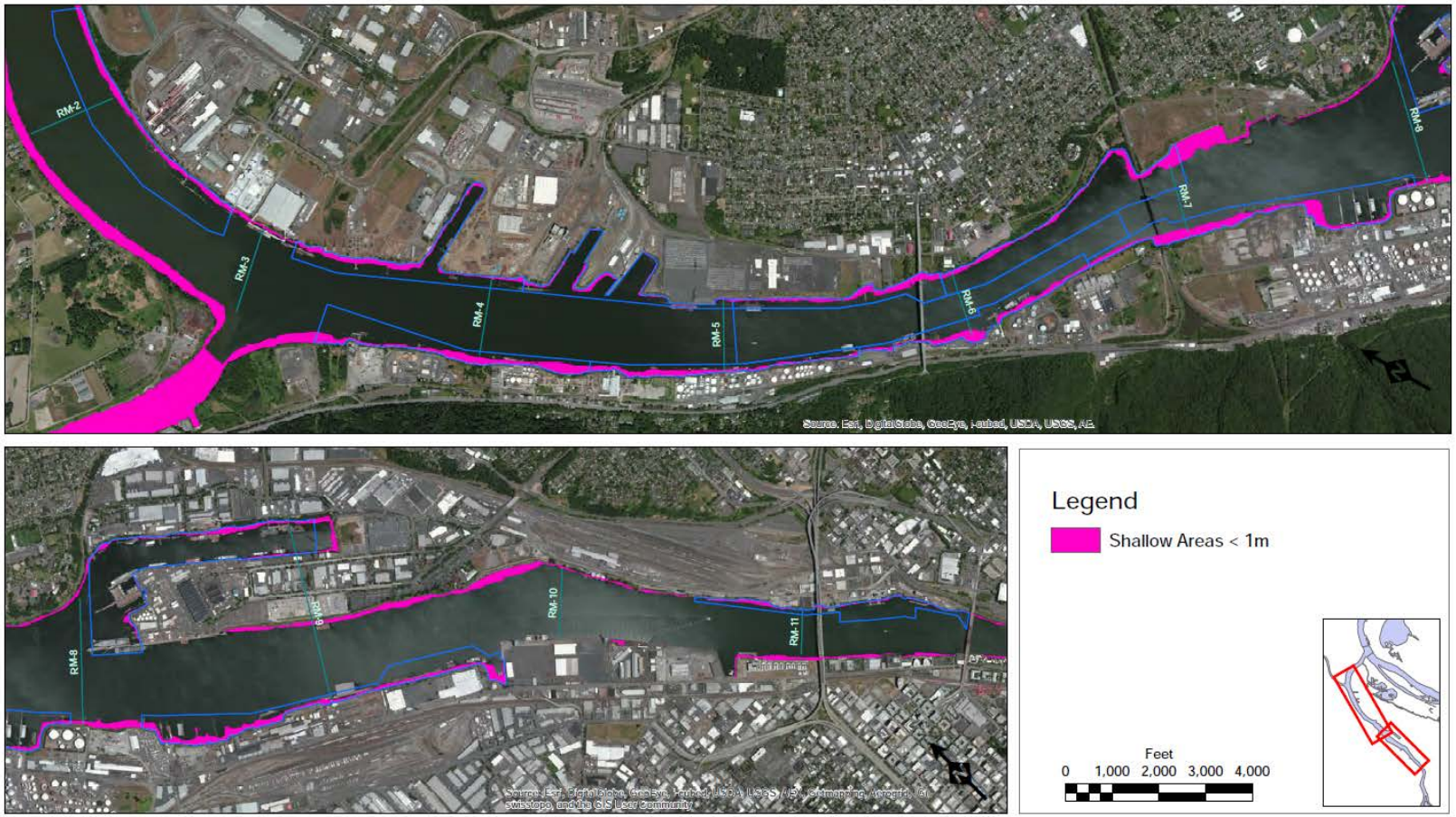
Erosion/Windwave Zones

Depositional



Depositional Areas

Shallow Areas

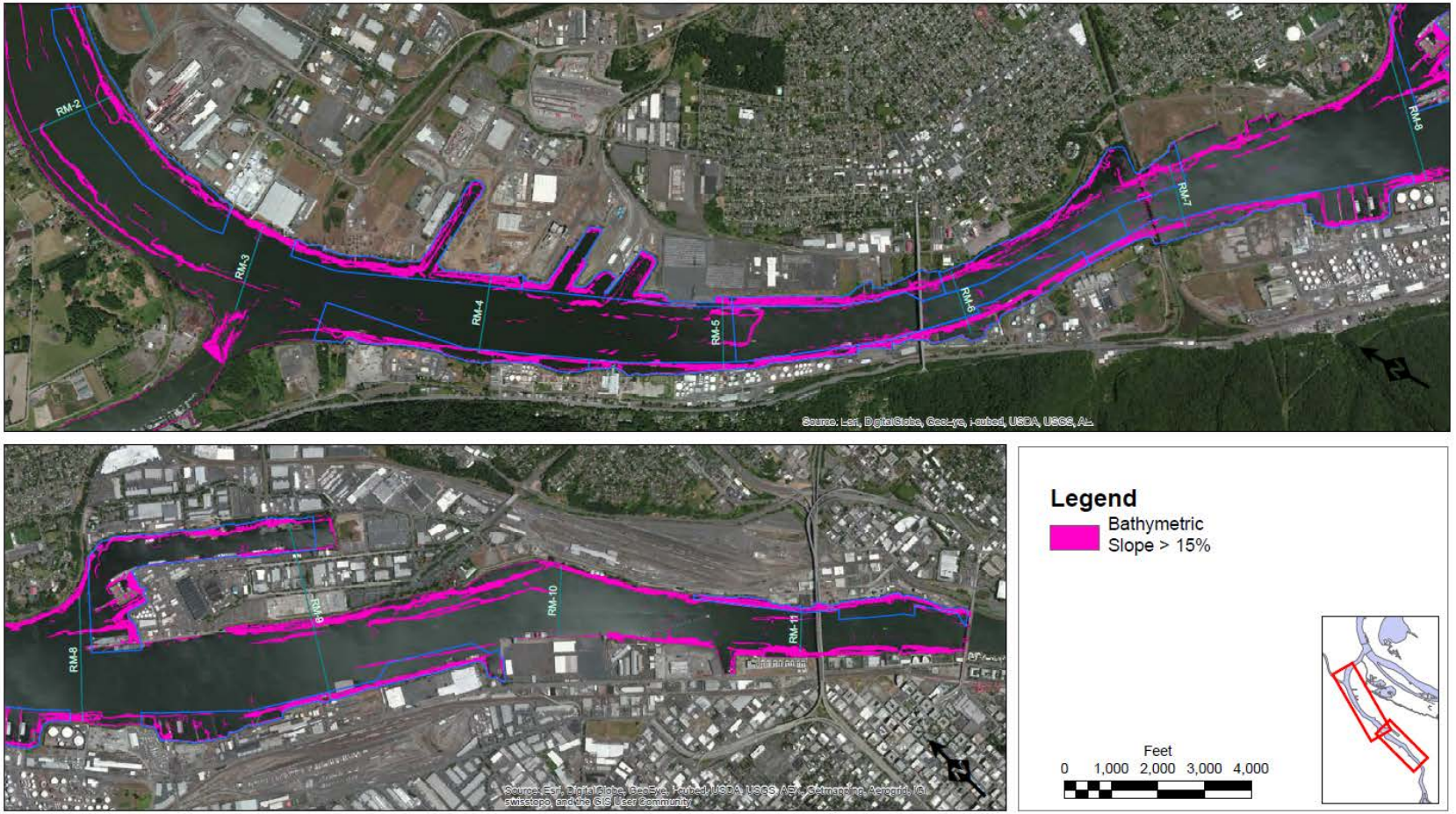


Shallow Areas

Sediment Bed Characteristics Criteria

- Slope > 15 % (Based on LWG 2009 Bathymetry)
- Rock, Cobble, Bedrock within potential dredge prism
  - none identified by LWG after EPA request

Bathymetry/Slope

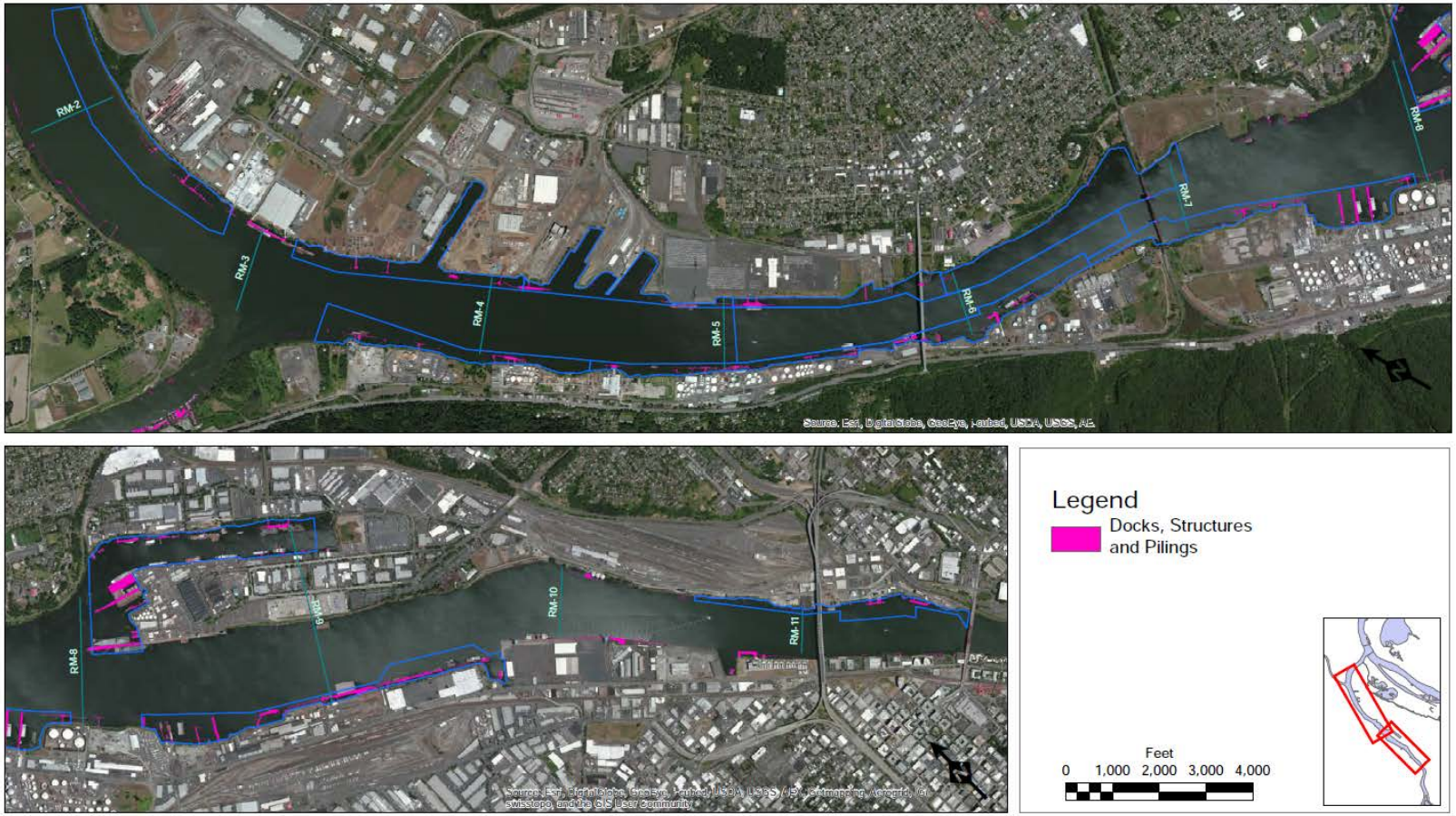


Bathymetric Slope

Anthropogenic Influences Criteria

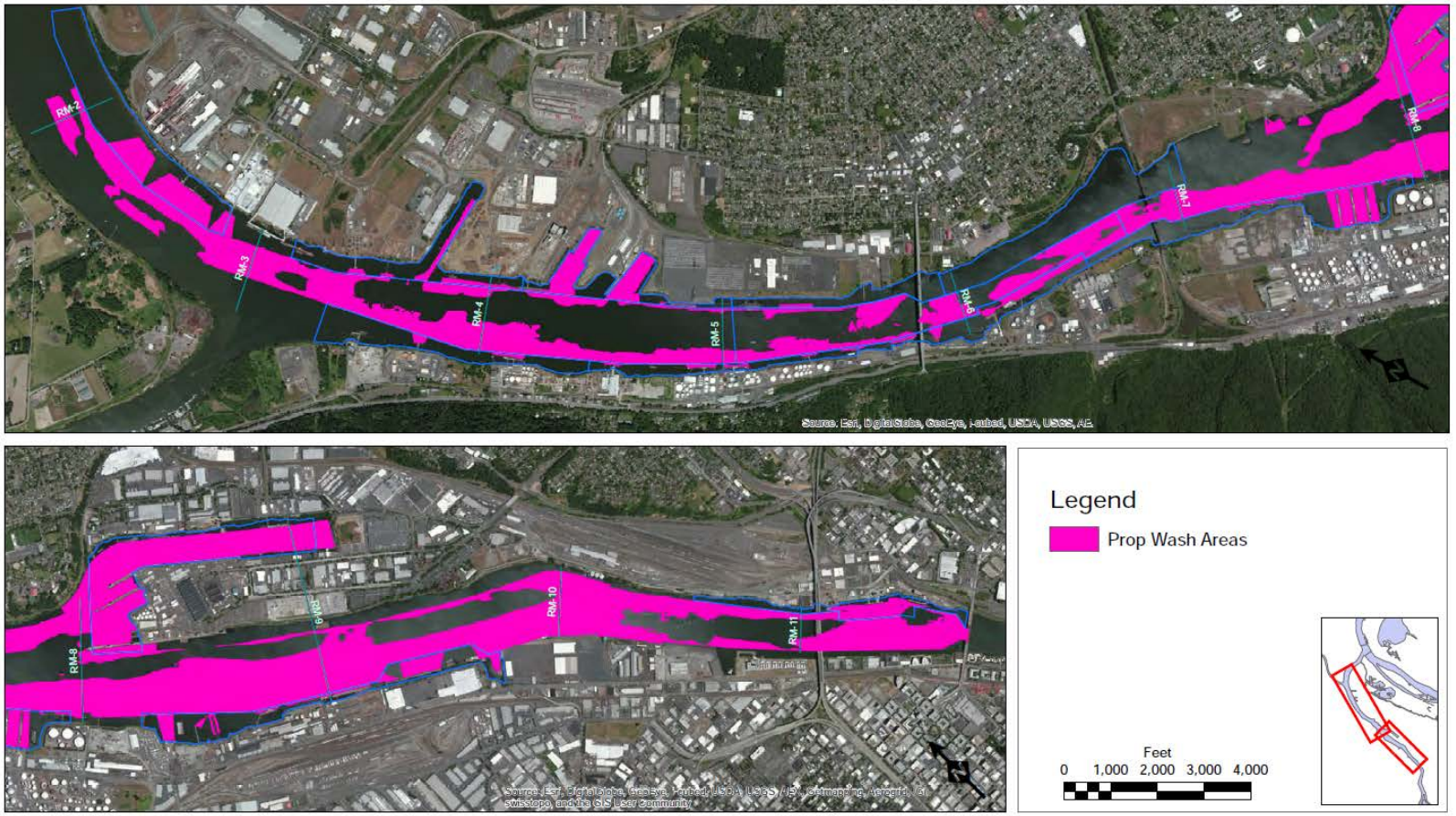
- Structures and Pilings (LWG provided + pilings and dolphins from debris layer)
- Prop Wash Zone– (LWG provided)
- Debris as indicated by side/scan sonar (LWG provided)

Structures and Pilings



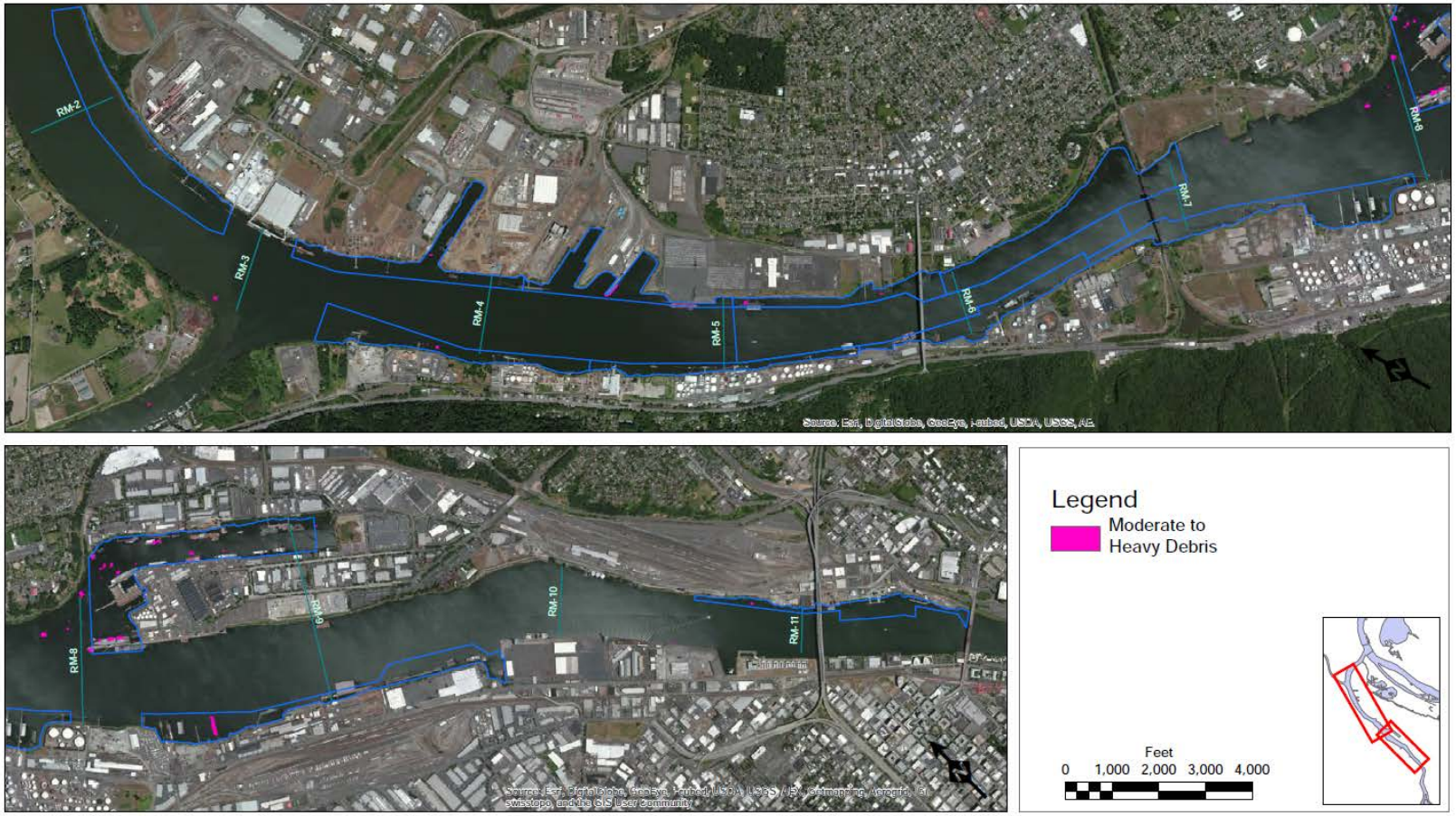
Docks, Structures and Pilings

Prop Wash Areas



Prop Wash Areas

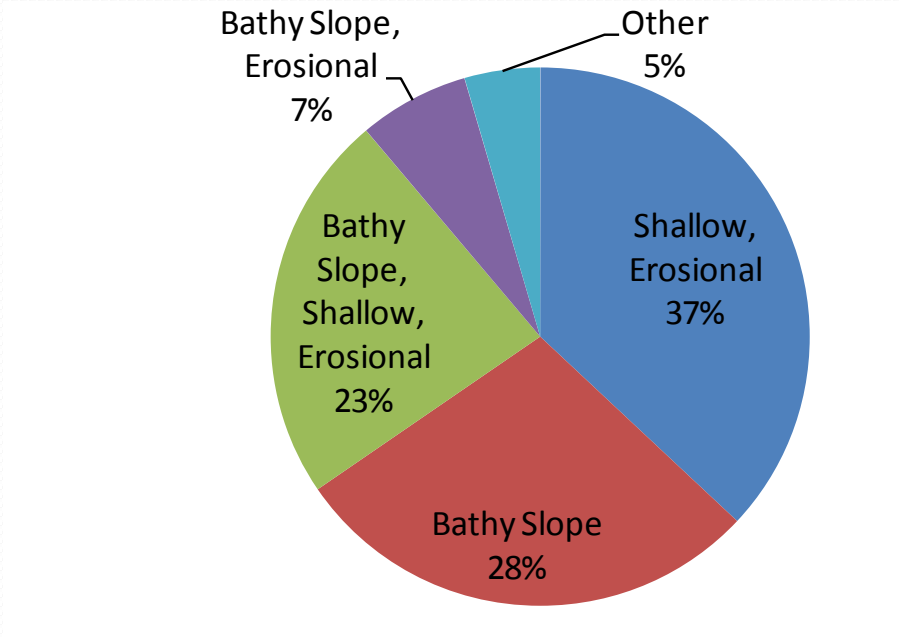
Debris



Debris

Conclusions

- In areas outside "off-ramps", dredging was selected due to these criteria:



- Primary drivers were: erosional, bathy slope, and shallow.
- Generally, multiple LoEs; single LoE in 32% of areas.

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Site Areas

Site Areas

- Based on receptors
- Account for receptor mobility
- Focus on high concentration areas
- Delineate areas of capping/dredging

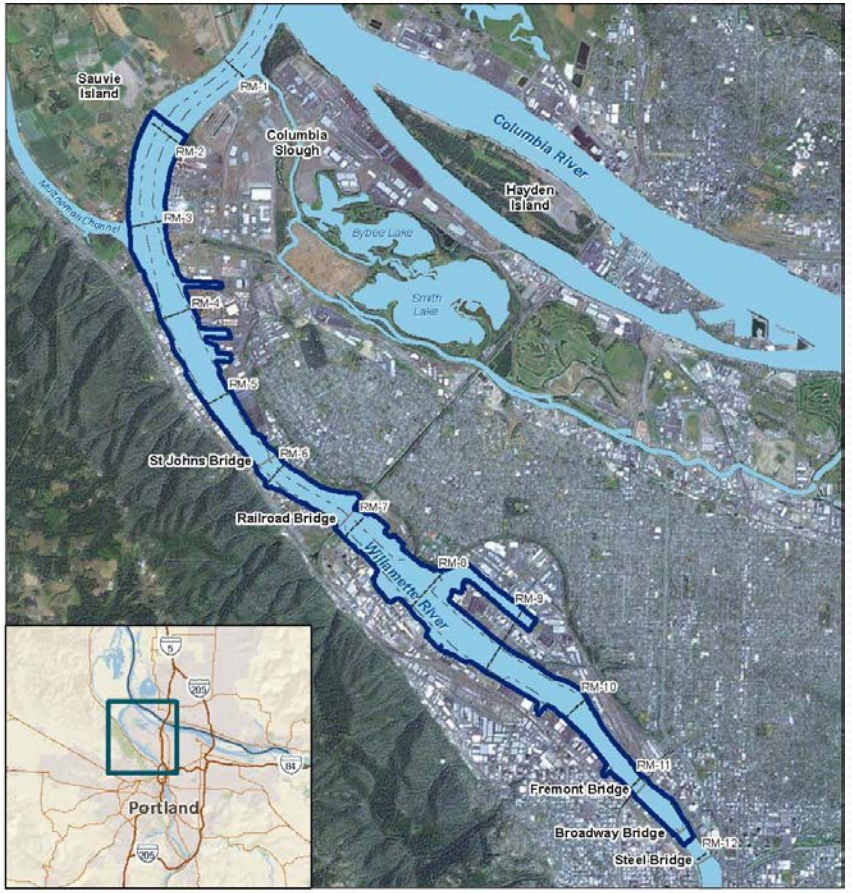
Site-wide

Example Receptors

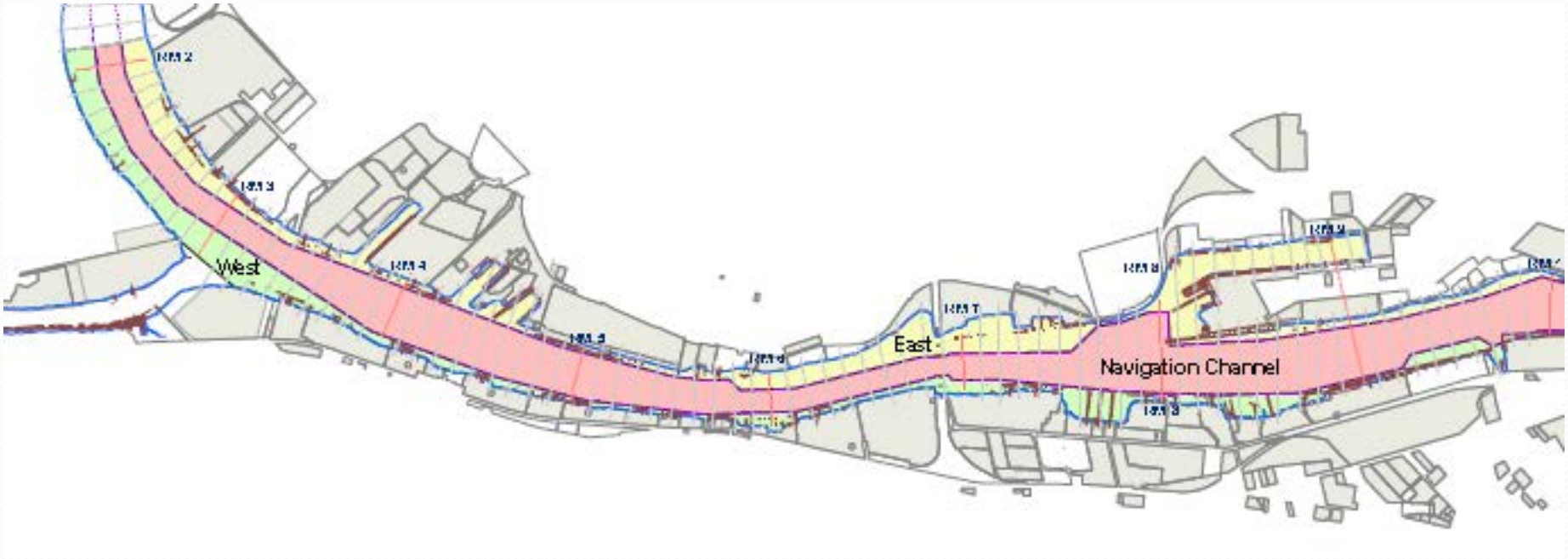
- Subsistence & Tribal Fishers
- Large-home range Fish
- Bald Eagle

Size

- ~10 RM
- 2,190 Acres



River Zones



- East Nearshore Zone
- West Nearshore Zone
- Navigation Channel
- Swan Island Lagoon

0.1 to 0.2 River Mile

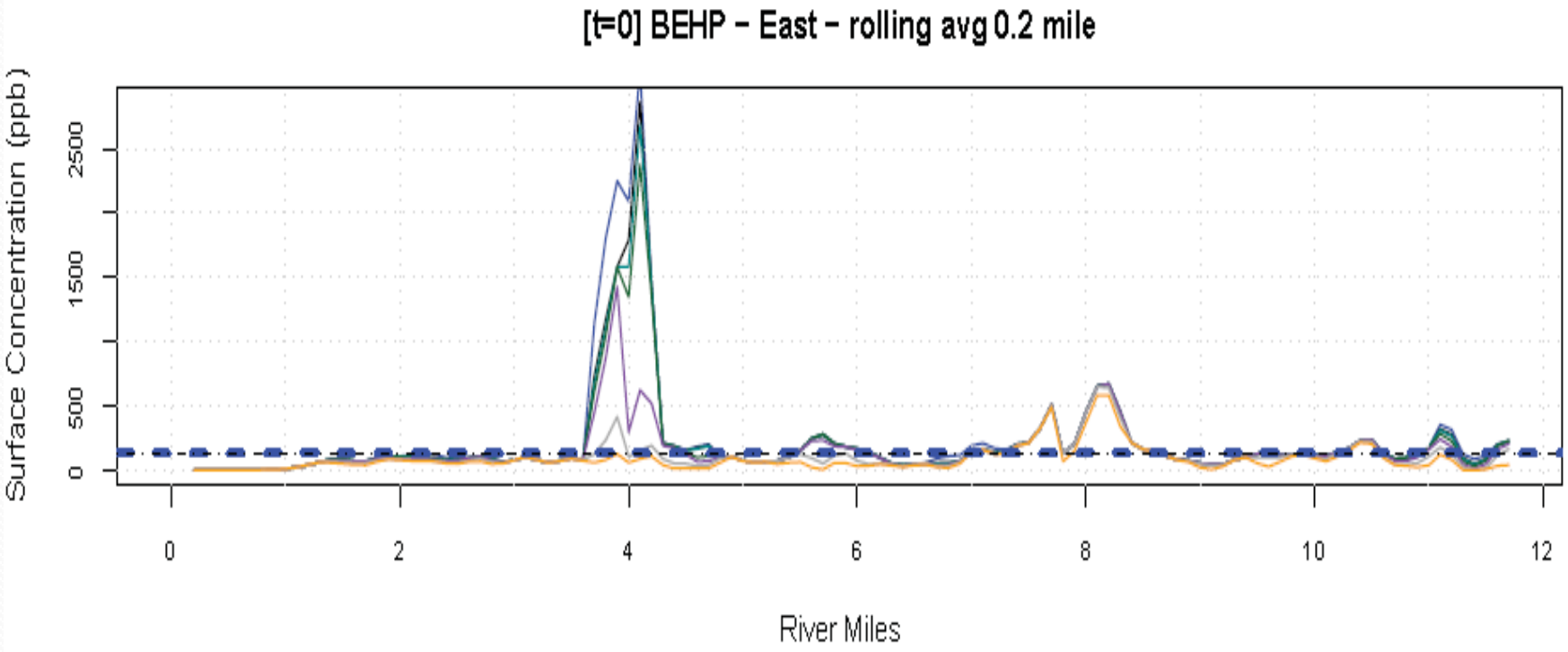
Receptors

- Sculpin
- Crayfish
- Benthic

Size

- Rolling 0.2 RM in River Zones

Example Rolling 0.2 RM



0.5 River Mile

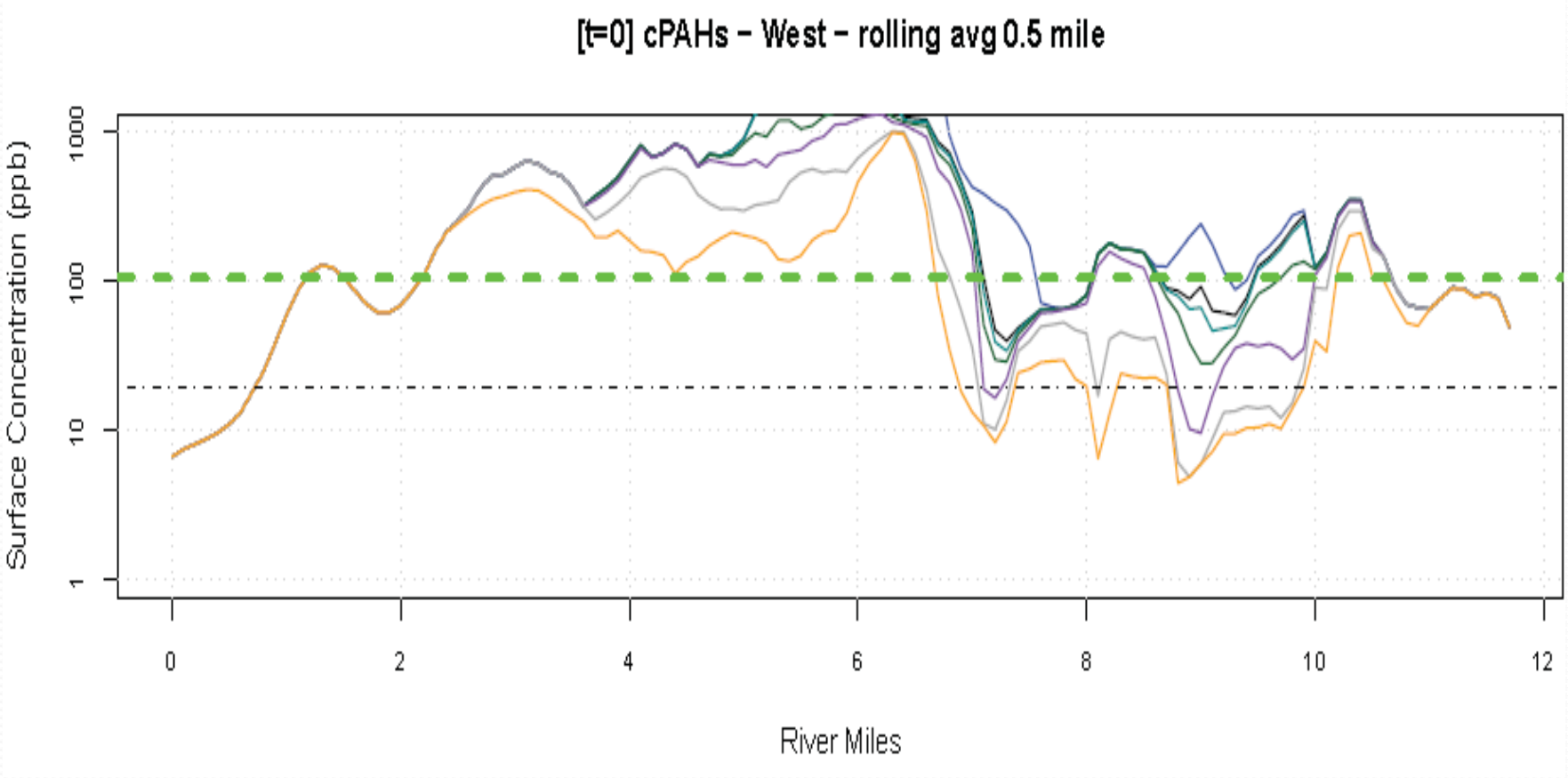
Receptors

- Human Direct Contact (nearshore only)

Size

- Rolling ½ RM in River Zones

Example Rolling 0.5 RM



1 River Mile

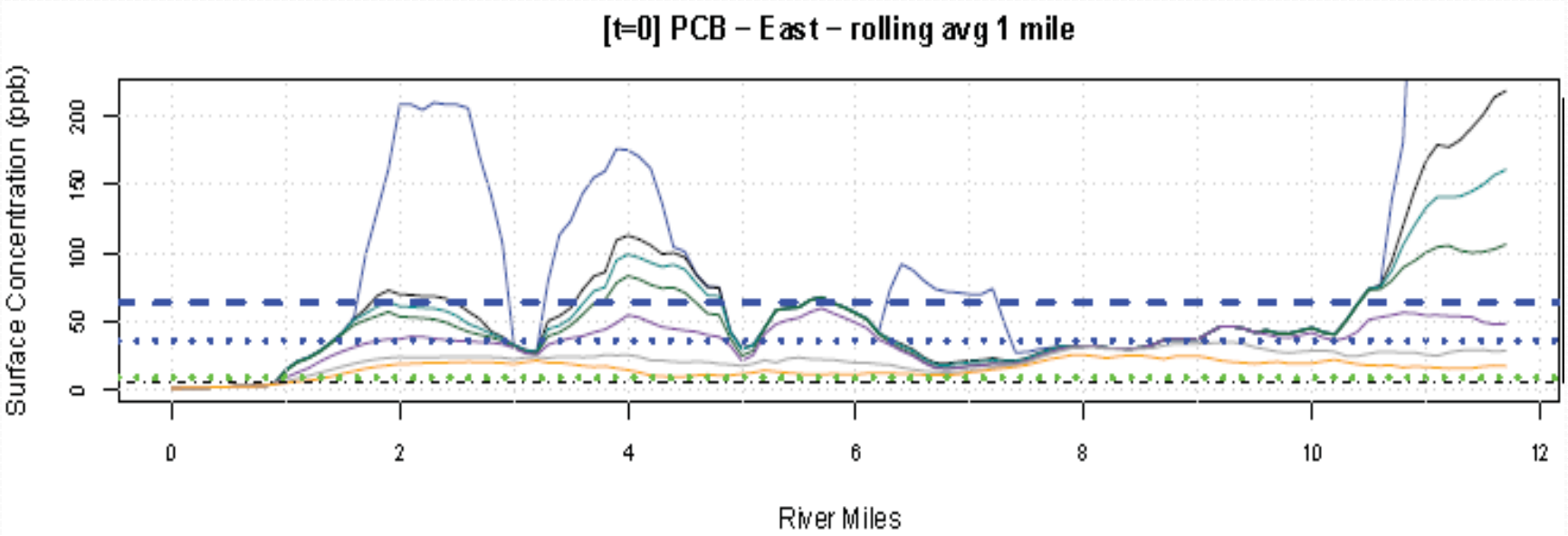
Receptors

- Recreational Fishers
- Smallmouth Bass
- Mink
- Osprey

Size

- Rolling RM in River Zones
- SDUs

Example Rolling 1 RM



Sediment Decision Units

Develop a spatial basis for evaluating remediation

- River Zones
- Centered on contaminant high concentration areas

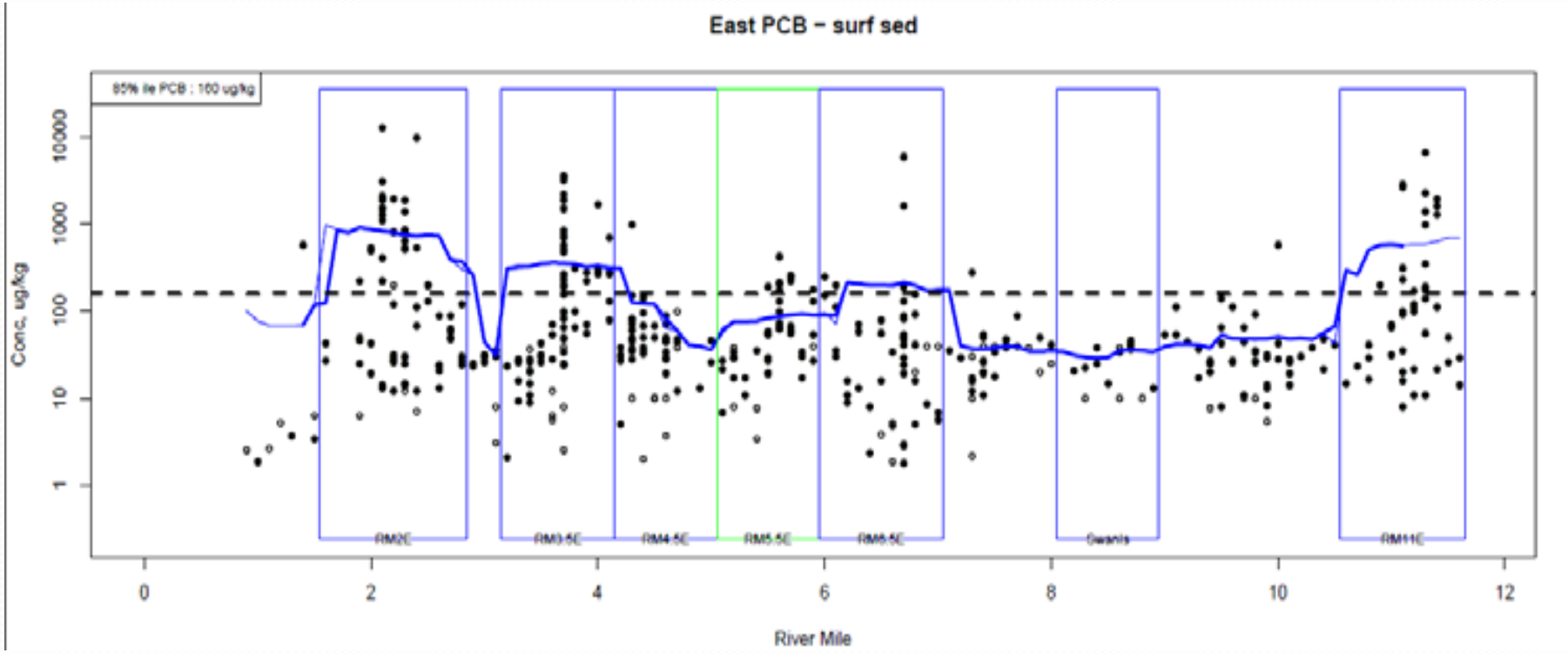
Goal

- Reproducibly defined, spatially based decision area
- Evaluate highest risk reduction

SDU Approach

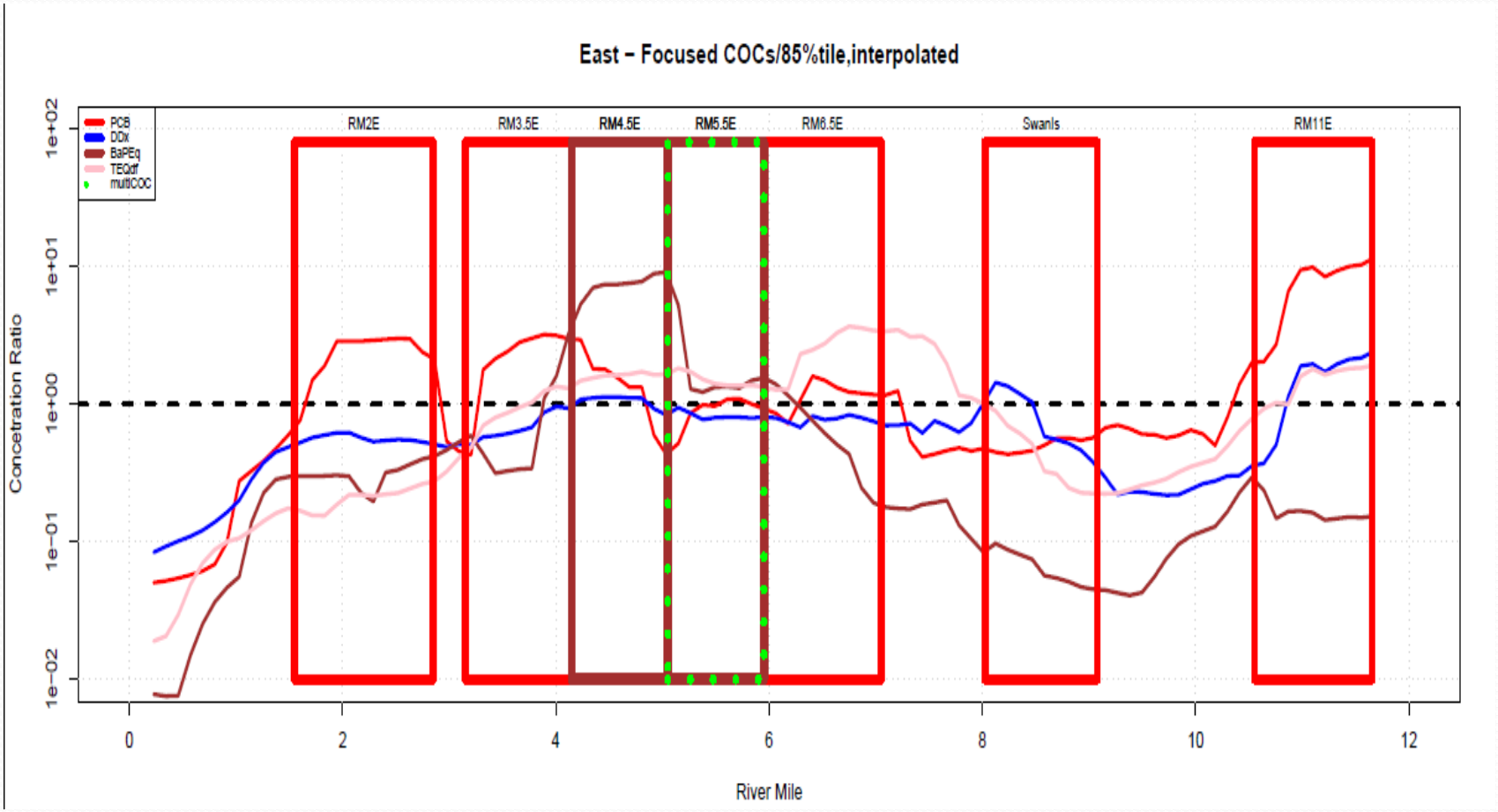
- Delineate areas of the site exhibiting the highest concentrations
- Segregate data based on river region
- Develop a rolling average based on non-weighted surface sediment results for the focused COCs
- Adjust SDU boundaries based on interpolated concentration contours
- Circle back to add additional SDUs based on other considerations (e.g., benthic risk, other COCs)

Example Rolling RM



Note: All SDUs shown, not just PCB related ones

Example 85% Normalization



Resulting SDU Evaluation Areas

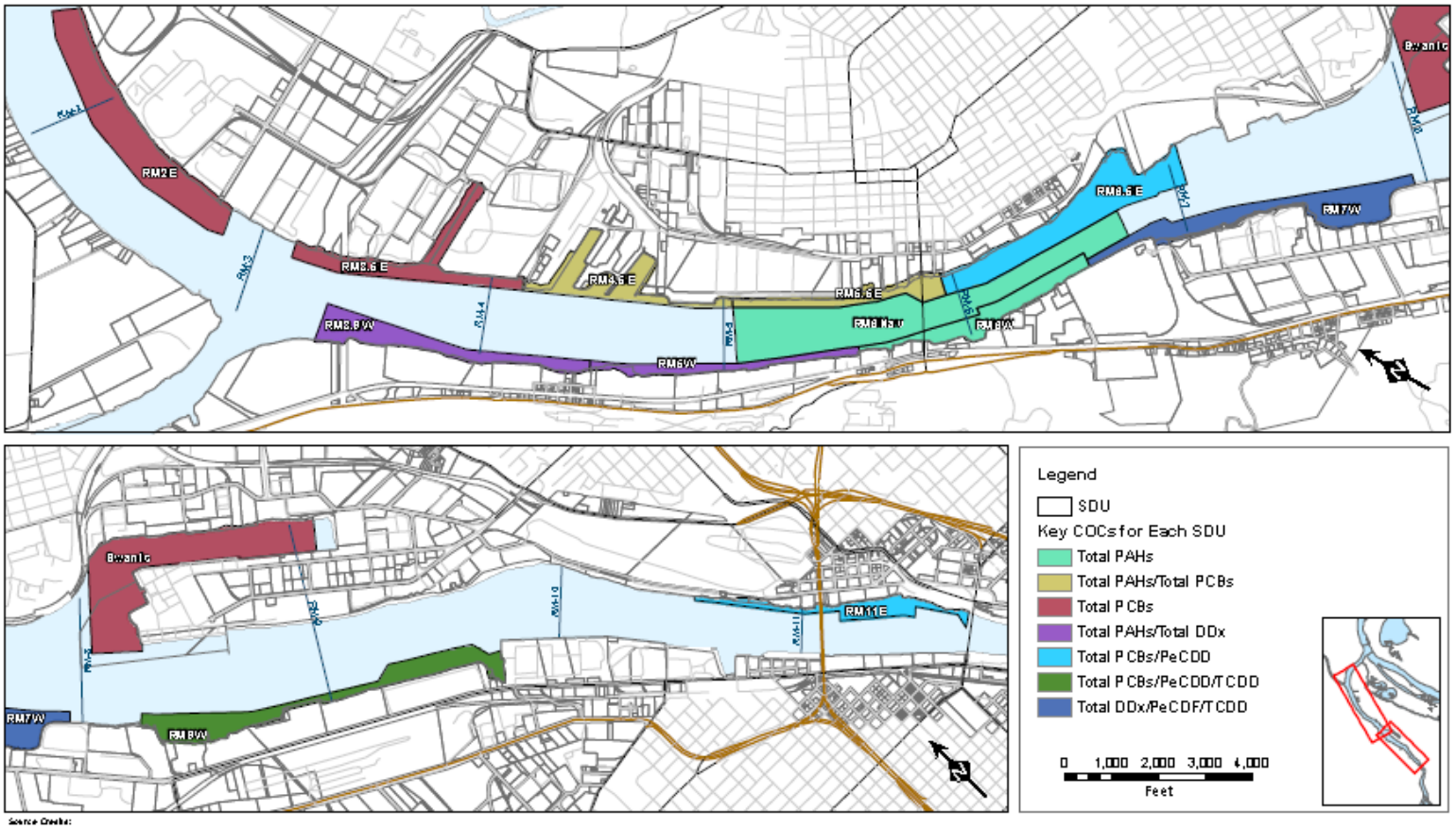


Figure 4.1-2. Sediment Decision Units and Key COCs

Sediment Management Areas

- Dredging/capping technology applied
- Developed from technology assignments
- Delineated by high concentration contours
  - Remedial Action Levels

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Cost

Major Point of Contention

- PRPs do not want costs underestimated for allocation
- PRPs want cost low
- Mitigation…cost too high
  - 14% capital costs – alt B
  - 58 acres – alt B
- Subtitle C
  - 45% capital costs – alt B
- Dredging unit costs (from LWG 2012)
  - $38.03/cy – open water
  - $53.66/cy - confined

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Principal Threat Waste

Principal Threat Waste

- Source Material - NAPL
  - Chlorobenzene - Arkema
  - PAHs - Gasco

- Highly Toxic – exceeds 10^{-3}

PCBs	> 200 µg/kg
cPAHs	> 100,000 µg/kg
DDx	> 7000 µg/kg
2,3,7,8-TCDD	> 0.02 µg/kg
2,3,7,8-TCDF	> 4 µg/kg
1,2,3,7,8-PeCDD	> 0.01 µg/kg
2,3,4,7,8-PeCDF	> 0.4 µg/kg
1,2,3,4,6,7,8-HxCDF	>0.3 µg/kg

PTW – Reliably Contained

Contaminant	PTW Contaminants Reliably Contained
Dioxins/Furans	Can be reliably contained
PAHs	Can be reliably contained
Chlorobenzene	<320 µg/kg
DDx	Can be reliably contained
Naphthalene	<140,000 µg/kg
PCBs	Can be reliably contained

Ex-situ Treatment Assumptions

- NAPL & PTW Not Reliably Contained
  - Chlorobenzene
  - Napthalene
  - PAHs
  - DDx mixed with chlorobenzene
- Treatment Method
  - Thermal Desorption

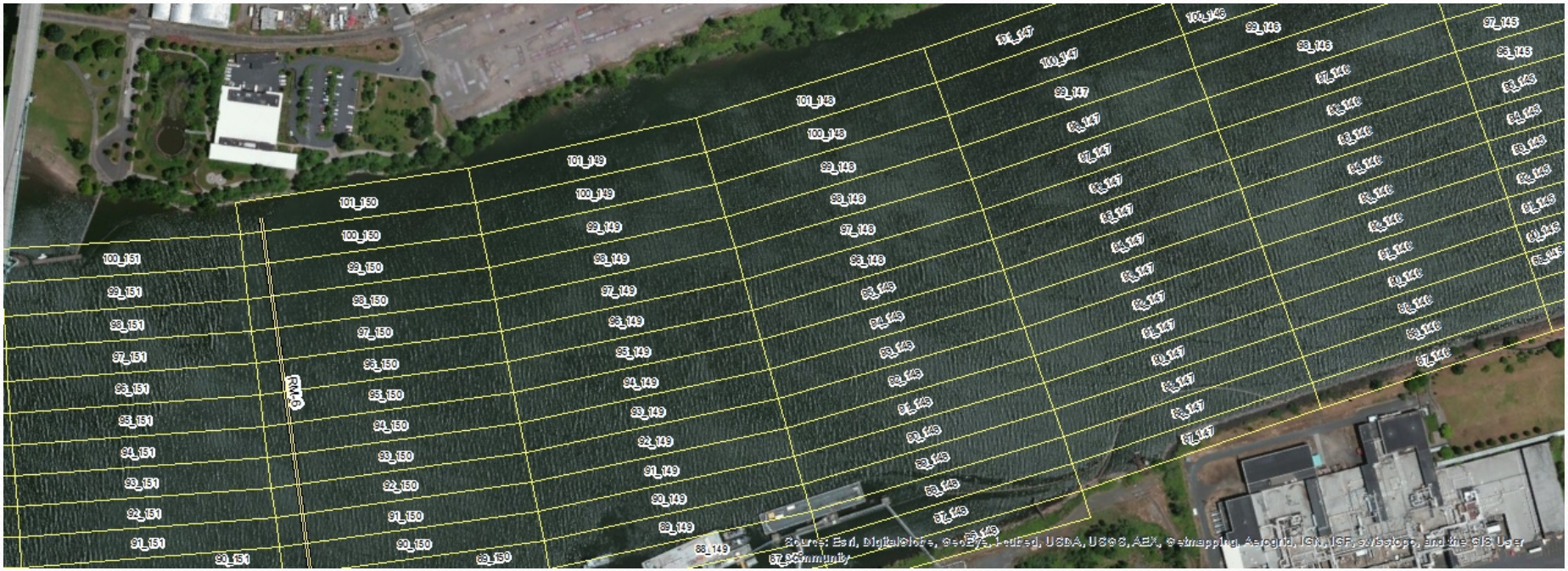
Portland Harbor

Modeling MNR

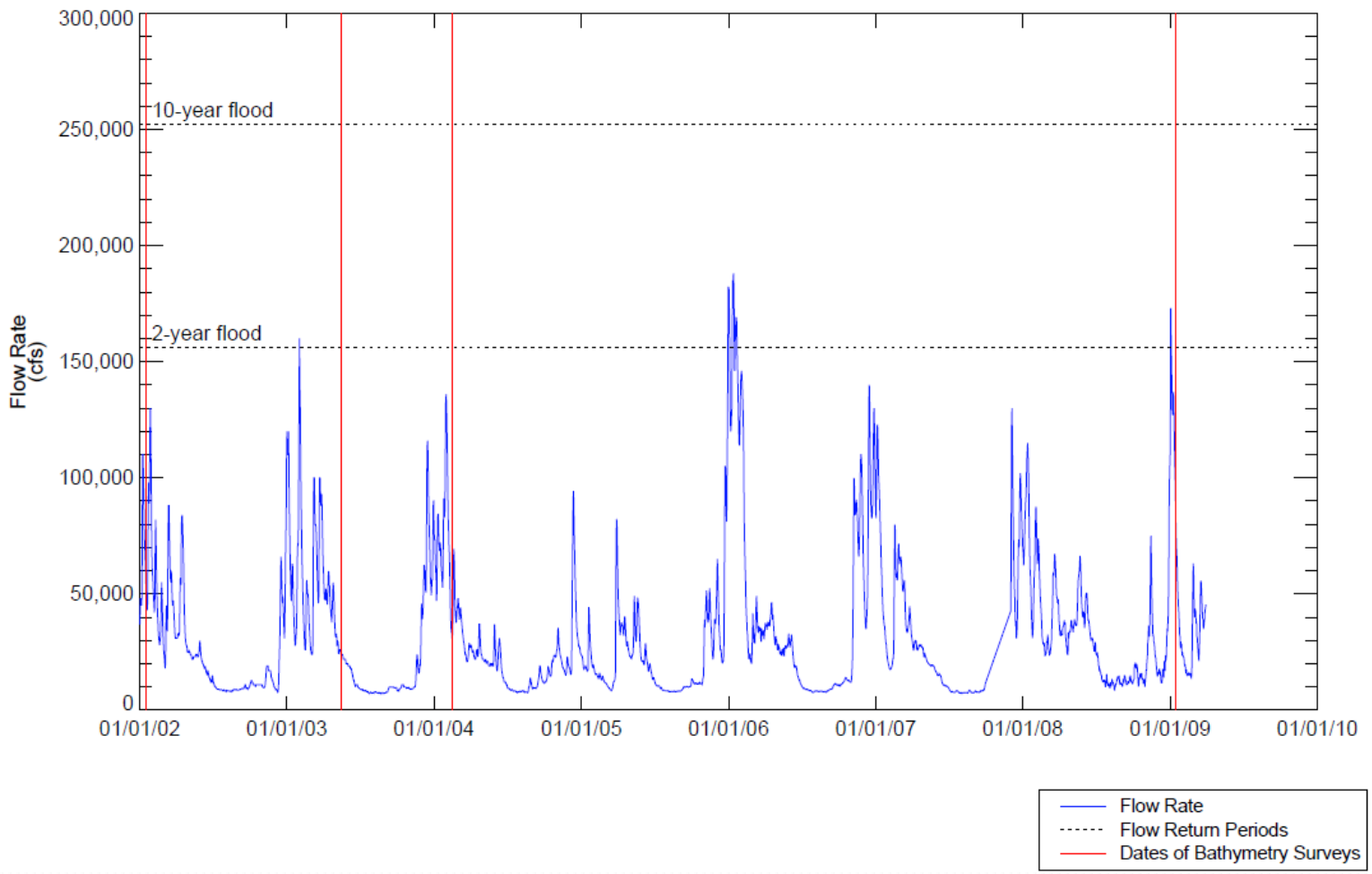
LWG hydrodynamic and sediment transport (HST) model

- Submitted in draft FS (2012)
- Used channel flow (EFDC) and channel sediment transport (SEDZLJ)
- Rejected by EPA
  - Models not coupled
  - Calibration was only for bathymetry, not chemistry
  - Complex system
    - Tidal fluctuations
    - Reverse flows
  - Did not account for bedload transport
  - Does not match CSM

Model Grid Cells Example

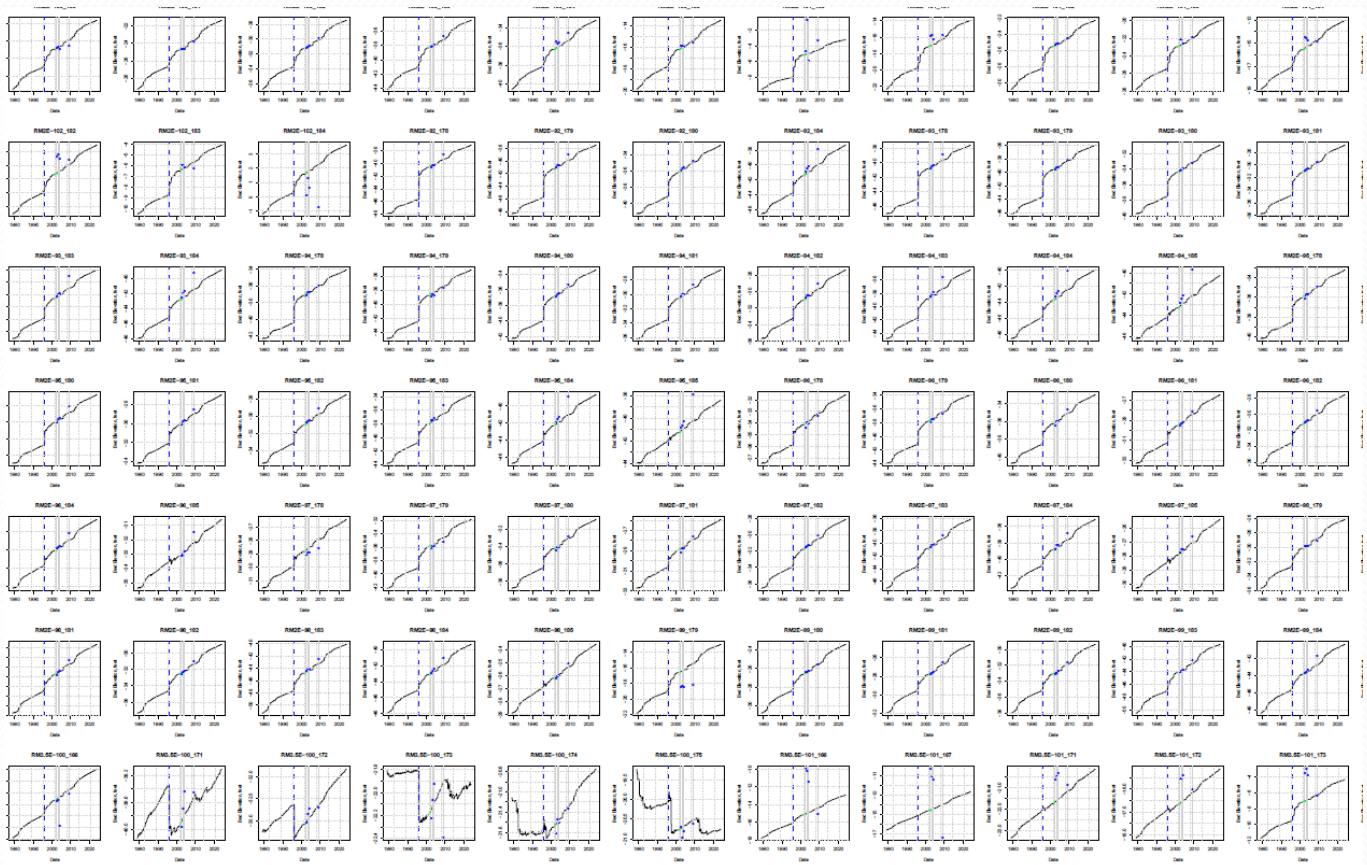


Bathymetric Surveys



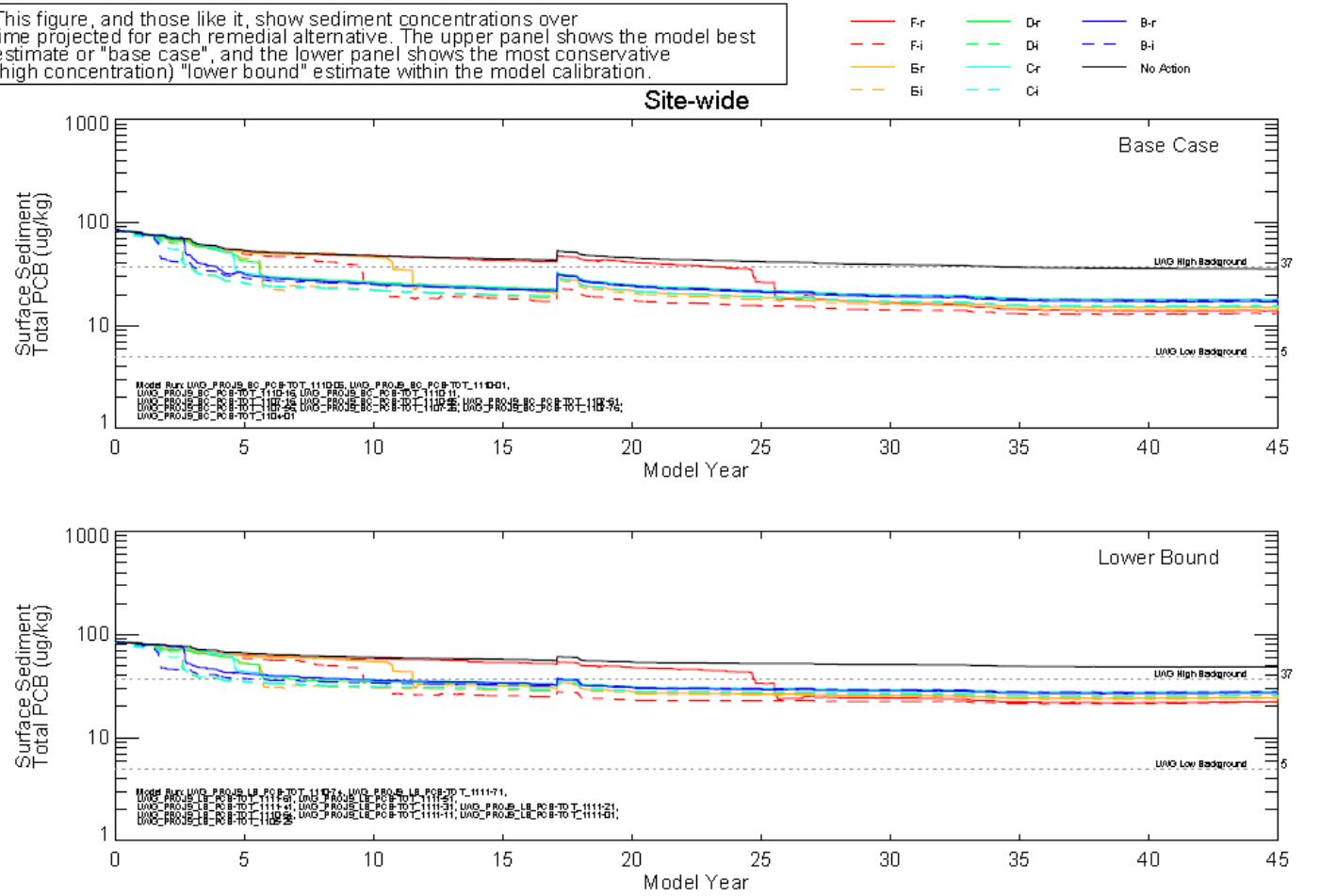
t>0 discussion

- LWG Model performance vs. Bathymetry graphs



Example of LWG Model Prediction

This figure, and those like it, show sediment concentrations over time projected for each remedial alternative. The upper panel shows the model best estimate or "base case", and the lower panel shows the most conservative (high concentration) "lower bound" estimate within the model calibration.



DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Figure 8.2.2-1
Portland Harbor RI/FS
Draft Feasibility Study
Simulation of FS Alternatives
Time Series of Surface Sediment (Top 1-ft) Total PCB Concentrations (Site-wide Average)

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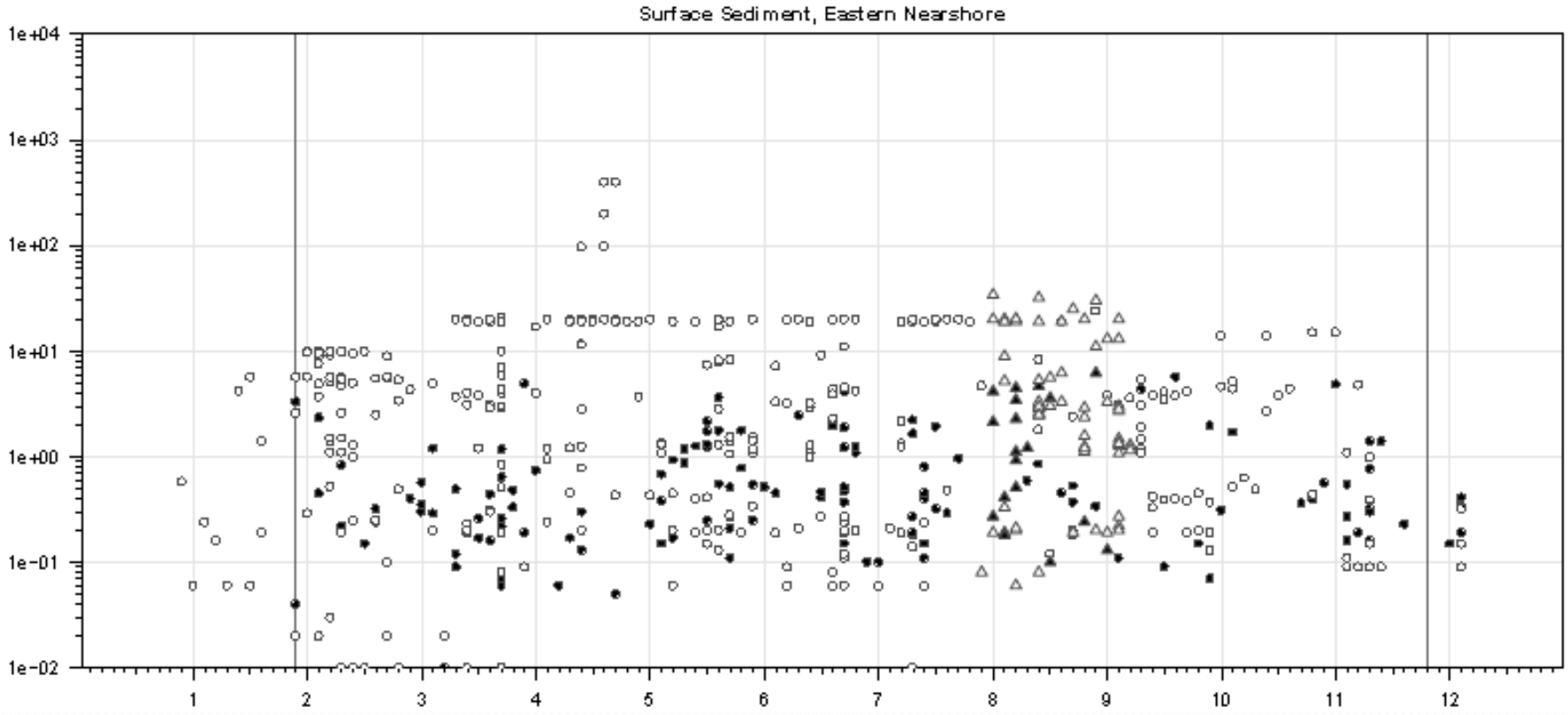
High-biasing Non-detects in Data Set

Example of High-biasing ND Hexachlorobenzene



EPA Contacts

Kristine Koch – Lead RPM

- (206) 553-6705
- koch.kristine@epa.gov

- Additional Information

http://www.epa.gov/region10/portlandharbor